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EXAMINER	
SYED, FARHAN M	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/723,160	MILLER ET AL.	
	Examiner	Art Unit	
	FARHAN M. SYED	2165	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *08 July 2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-7 and 9-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-7 and 9-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. Claims 1-7 and 9-20 are pending. The Examiner acknowledges amended claims 1, 18, and 20 and cancelled claim 8.

2. The Examiner notes that the Office indeed had reopened prosecution to enter a new ground of rejection, see Non-Final Office action, mailed 08 April 2008, responsive to a Notice of Appeal, filed 12 March 2008.

Response to Remarks/Argument

3. Applicant's arguments filed 08 July 2008 have been fully considered but they are not persuasive for the reasons set forth below.

Applicant argues:

(1) "It is believed that the limitations of claims 1, 18, and 20 as amended are not met by the collective teachings of the allegedly admitted prior art in view of Cheriton and Buia."

The Examiner disagrees and has addressed the argument in the rejection below.

Hence, the Applicant's arguments do not distinguish over the claimed invention over the prior art of record.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 1-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant's Admission of Prior Art (Pub. No. 2005/0114655 A1), hereinafter AAPA, in view of Cheriton (USPN 7,149,216), hereinafter Cheriton, and further in view of Buia et al. (USPN 2004/0078683 A1), hereinafter Buia.

a. **Per claim 1,** *AAPA* discloses a method of generating a representation of an access control list **(See pg. 1 paragraph [0003] where routers or switches typically utilize ACLs.)**, the representation being utilizable in a processor **(See pg. 1 paragraph [0004] where network processors are used.)**, the method comprising the steps of:

determining a plurality of rules of the access control list, each of at least a subset of the rules having a plurality of fields and a corresponding action **(See page 1 paragraph [0003] where an ACL generally comprises a set of rules, the rules having fields and corresponding actions.).**

AAPA does not explicitly disclose processing the rules to generate a multi-level tree representation of the access control list, each of one or more of the levels of the

tree representation being associated with a corresponding one of the fields; and wherein at least one level of the tree representation comprises a plurality of nodes.

However, *Cheriton* discloses the ACL having rules compiled into an ACL-M-trie Plus data structure having multiple levels, and each level having of a plurality of nodes being associated with fields, the fields included source and destination addresses **(See col. 2 lines 15-18 and 35-37, and col. 4 lines 5-9 where M-trie Plus data structure is a multi-level tree.)**. *Cheriton* also discloses wherein for each level of the tree representation that corresponds to a field of a rule of the access control list **(See *Cheriton* col. 4 lines 35-41 where first and second levels corresponding to fields including source and destination address.)**, a master list of nodes is maintained, each node comprising at least one of information characterizing one or more field values associated with that node **(See *Cheriton* col. 3 lines 53-67 where extended ACL List is master list.)**, one or more subtree pointers for that node, and a reference count indicating how many ancestor nodes are pointing to that node **(See *Cheriton* col. 3 lines 46-51 where oppointer includes pointers for a node and opcode; i.e. subtree pointers and a reference count.)**. *Cheriton* also discloses wherein the tree representation is generated by sequentially processing the rules of the access control list, the processing for a given rule comprising applying values of fields of the given rule to one or more existing nodes of the tree representation **(See col.1 lines 55-59 and col. 2 lines 15-19 of *Cheriton* for access control list processing.)**, and wherein when a particular value of a field of the given rule is applied to a given node **(See col. 2**

lines 35-43 where sequence of nodes have applied source and destination address values, see col. 4 lines 5-9.).

At the time of the invention, it would have been obvious to a person of ordinary skill in the art of generating Access Control Lists (ACLs) (AAPA) to generate a multi-level tree representation of the access control list as taught by *Cheriton*. The motivation would have been to provide a faster way of traversing the ACL due to earlier methods being relatively slow **(See col. 1 lines 39-46 of Cheriton.)**.

AAPA in view of *Cheritan* does not explicitly disclose that with two or more of the nodes of a level having a common subtree, the tree representation including only a single copy of that subtree; the subtree comprising at least one node that is not a leaf node of the tree representation; the tree representation being characterizable as a directed graph in which each of the two nodes having the common subtree points to the single copy of the common subtree and a copy is made of the node, the field value is applied to the copied node, and the resultant updated node is added to the master list of the corresponding level.

However, Buia discloses two or more of the nodes of a level of a tree in a directed graph representation having a common subtree pointing to a single copy of the common subtree comprising at least one node that is not a leaf node of the tree **(See Fig. 7B where two nodes 'FAULT A' and 'FAULT F' have common subtree at node 'FAULT C' where node 'FAULT C' of the common subtree is not a leaf node and the subtree is the only copy in the tree representation. The tree representation is characterized as a directed graph.)**. *Buia* discloses a copy is made of the node, the

field value is applied to the copied node, and the resultant updated node is added to the master list of the corresponding level **(See pg. 8 paragraph [0099] Buia teaches creating copy of node.)**.

At the time of the invention, it would have been obvious to a person of ordinary skill in the art of generating Access Control Lists (ACLs) in a multi-level tree representation (as *AAPA, Cheritan, and Buia)* to have two or more of the nodes of a level of the tree in a directed graph representation having a common subtree pointing to a single copy of the common subtree and discloses a copy is made of the node, the field value is applied to the copied node, and the resultant updated node is added to the master list of the corresponding level as taught by *Buia*. The motivation would have been to optimize efficiency and productivity by creating an ACL tree representation that handles identical tree portions or subtrees by sharing subtrees **(as seen on pg. 3 paragraph [0025] and pg. 9 paragraph [0101] of Buia.)**.

b. **Per claim 2,** *AAPA* discloses wherein the common subtree is implemented at least in part as a matching table **(AAPA See pg. 1 paragraph [0009] where ACL rules are stored in table format. Also see [0003] where ACL typically imply an ordered matching or ordered list of *AAPA*.)**.

c. **Per claim 3,** *Cheriton* discloses wherein the plurality of fields comprises at least first and second fields, the first field comprising a source address field and the second field comprising a destination address field **(See pg. 1 paragraph [0003] where**

fields define source and destination addresses of *Cheriton*.).

d. **Per claim 4,** *Cheriton* discloses wherein a final level of the tree representation comprises a plurality of leaf nodes, each associated with one of the actions of the plurality of rules **(See col. 2 lines 35-42, col. 3 lines 53-63, and col. 4 lines 5-9 of *Cheriton* where second level of nodes of the addresses is associated with routing rules.)**.

e. **Per claim 5,** *Cheriton* discloses wherein the at least one level of the tree representation comprises a root level of the tree representation **(See col. 4 lines 1-4 of *Cheriton* where tree, including roots; i.e. root level.)**.

f. **Per claim 6,** *Buia* wherein a second level of the tree representation includes a plurality of nodes, each being associated with a subtree of a given one of the plurality of nodes of the root level of the tree representation **(See Figs. 7B and Fig. 8 where tree representation may include plurality of root level nodes as in 7B and a second level with a plurality of nodes from a root level.)**.

g. **Per claim 7,** *Cheriton* discloses wherein for each level of the tree representation that corresponds to a field of a rule of the access control list **(See *Cheriton* col. 4 lines 35-41 where first and second levels corresponding to fields including source and destination address.)**, a master list of nodes is maintained,

each node comprising at least one of information characterizing one or more field values associated with that node **(See *Cheriton* col. 3 lines 53-67 where extended ACL List is master list.)**, one or more subtree pointers for that node, and a reference count indicating how many ancestor nodes are pointing to that node **(See *Cheriton* col. 3 lines 46-51 where oppointer includes pointers for a node and opcode; i.e. subtree pointers and a reference count.)**.

h. **Per claims 9,** *Buia* discloses wherein the updated node is compared with other nodes of the master list and if a duplicate node is found, the copied node is deleted and a pointer to the duplicate node is provided to an ancestor node that points to the given node, a subtree pointer of the ancestor node is updated to the duplicate node pointer, a reference count of the duplicate node now pointed to by the ancestor node is incremented and a reference count of the given node previously pointed to by the ancestor node is decremented **(See pg. 8 paragraph [0099] Buia teaches creating copy of node.)**.

i. **Per claims 10,** *Buia* discloses the method of claim 9 wherein if a duplicate node is found in the master list, that duplicate node is moved to an initial position in the master list **(See pg. 8 paragraph [0099] for copy node.)**.

j. **Per claims 11,** *Cheriton* discloses the wherein for each node in the master list **(See Cheriton were master list is extended ACL list)**, a copy pointer is

maintained, and wherein when a copied node is compared to the master list and a duplicate node is found, the copied node is added as a copy to the master list for use in conjunction with the processing of a subsequent rule **(See AAPA for ACL rules. See Buia pg. 8 paragraph [0099] for copy node.)**.

k. **Per claims 12,** *Cheriton* and *Buia* discloses wherein for each node in the master list **(See Cheriton col. 3 lines 64-66 where extended ACL list is master list)**, a signature is maintained in order to facilitate node comparisons, a full comparison of node subtrees being performed only if a match is obtained between node signatures **(See Buia Fig. 7B for common subtree node.)**.

l. **Per claims 13,** *Cheriton* discloses wherein the signature for a given node is generated as a function of at least one of a field value and a subtree pointer **(See Cheriton col. 3 lines 46-51 for subtree pointer; i.e. oppointer and col. 4 lines 5-10 for field values; i.e. source and destination address.)**.

m. **Per claim 14,** *AAPA* in view of *Cheriton* and *Buia* discloses wherein the corresponding actions include at least an accept action and a deny action **(See rejection of claim 1 above where an accept or deny action is involved in routing the packets.)**.

n. **Per claim 15,** *AAPA* discloses the method of claim 1 further including the step of storing at least a portion of the tree representation in memory circuitry accessible to the processor **(See AAPA pg. 1 paragraph [0007] where memory is taught.)**.

o. **Per claim 16,** *AAPA* and *Cheriton* discloses the method of claim 1 further including the step of utilizing the stored tree representation to perform an access control list based function in the processor **(See AAPA pg. 1 paragraph [0004] for utilizing in the network processor, [0007] for memory, and *Cheriton* col. 2 lines 15-20 for stored tree structure.)**.

p. **Per claim 17,** *AAPA* discloses the method of claim 16 wherein the access control list based function comprises packet filtering **(See AAPA pg. 1 paragraph [0004] where packet filtering is taught)**.

q. **Per claim 18,** rejection of claim 1 is incorporated. Claim 18 is rejected under the same rationale as claim 1. *AAPA* in view of *Cheriton* and *Buia* discloses an apparatus configured for performing one or more processing operations utilizing a representation of an access control list, the access control list comprising a plurality of rules, each of at least a subset of the rules having a plurality of fields and a corresponding action **(See AAPA paragraph [0003] for ACL comprising rules having fields.)**, the apparatus comprising:

a processor having memory circuitry associated therewith **(See AAPA pg. 1 paragraph [0004] for network processors and [0007] for memory circuitry.)**;

the memory circuitry being configured for storing **(See AAPA pg. 1 [0007] for memory circuitry)** at least a portion of a multi-level tree representation of the access control list, each of one or more of the levels of the tree representation being associated with a corresponding one of the fields **(See Cheriton cols. 2 lines 35-44 for levels of multi-level tree representation of ACL.)**;

the processor being operative to utilize the stored tree representation to perform an access control list based function **(See AAPA pg. 1 paragraph [0004] for network processors in view of Cheriton cols. 2 lines 35-44 for tree representation to perform ACL function.)**

wherein at least one level of the tree representation comprises a plurality of nodes **(See col. 2 lines 15-18 and 35-37, and col. 4 lines 5-9 of Cheriton where M-trie Plus data structure is a multi-level tree.)**,

Cheriton also discloses wherein for each level of the tree representation that corresponds to a field of a rule of the access control list **(See *Cheriton* col. 4 lines 35-41 where first and second levels corresponding to fields including source and destination address.)**, a master list of nodes is maintained, each node comprising at least one of information characterizing one or more field values associated with that node **(See *Cheriton* col. 3 lines 53-67 where extended ACL List is master list.)**, one or more subtree pointers for that node, and a reference count indicating how many ancestor nodes are pointing to that node **(See *Cheriton* col. 3 lines 46-51 where**

oppointer includes pointers for a node and opcode; i.e. subtree pointers and a reference count.). *Cheriton* also discloses wherein the tree representation is generated by sequentially processing the rules of the access control list, the processing for a given rule comprising applying values of fields of the given rule to one or more existing nodes of the tree representation **(See col.1 lines 55-59 and col. 2 lines 15-19 of *Cheriton* for access control list processing.)**, and wherein when a particular value of a field of the given rule is applied to a given node **(See col. 2 lines 35-43 where sequence of nodes have applied source and destination address values, see col. 4 lines 5-9.)**.

AAPA in view of *Cheritan* does not explicitly disclose that with two or more of the nodes of a level having a common subtree, the tree representation including only a single copy of that subtree; the subtree comprising at least one node that is not a leaf node of the tree representation; the tree representation being characterizable as a directed graph in which each of the two nodes having the common subtree points to the single copy of the common subtree and a copy is made of the node, the field value is applied to the copied node, and the resultant updated node is added to the master list of the corresponding level.

However, Buia discloses two or more of the nodes of a level of a tree in a directed graph representation having a common subtree pointing to a single copy of the common subtree comprising at least one node that is not a leaf node of the tree **(See Fig. 7B where two nodes 'FAULT A' and 'FAULT F' have common subtree at node 'FAULT C' where node 'FAULT C' of the common subtree is not a leaf node and the subtree is the only copy in the tree representation. The tree representation is**

characterized as a directed graph.). *Buia* discloses a copy is made of the node, the field value is applied to the copied node, and the resultant updated node is added to the master list of the corresponding level **(See pg. 8 paragraph [0099] Buia teaches creating copy of node.)**.

At the time of the invention, it would have been obvious to a person of ordinary skill in the art of generating Access Control Lists (ACLs) in a multi-level tree representation (as *AAPA, Cheritan, and Buia)* to have two or more of the nodes of a level of the tree in a directed graph representation having a common subtree pointing to a single copy of the common subtree and discloses a copy is made of the node, the field value is applied to the copied node, and the resultant updated node is added to the master list of the corresponding level as taught by *Buia*. The motivation would have been to optimize efficiency and productivity by creating an ACL tree representation that handles identical tree portions or subtrees by sharing subtrees **(as seen on pg. 3 paragraph [0025] and pg. 9 paragraph [0101] of Buia.)**

r. **Per claim 19,** rejection of claim 18 is incorporated. *AAPA* discloses the apparatus of claim 18 wherein the memory circuitry comprises at least one of internal memory and external memory of the processor **(See AAPA paragraph [0007] memory circuitry and [0004] for processor.)**

s. **Per claim 20,** rejection of claim 1 is incorporated. Claim 20 is rejected under the same rationale as claim 1. *AAPA* in view of *Cheriton* and *Buia* discloses an

article of manufacture comprising a machine-readable storage medium having program code stored thereon, the program code generating a representation of an access control list, the representation being utilizable in a processor **(See AAPA pg. 1 paragraph [0003] for ACL [0004] for processor, and [0007] for article of manufacture comprising machine-readable storage medium, i.e. memory.)**, wherein the program code when executed implements the steps of:

determining a plurality of rules of the access control list, each of at least a subset of the rules having a plurality of fields and a corresponding action **(See AAPA page 1 paragraph [0003] where an ACL generally comprises a set of rules, the rules having fields and corresponding actions.)**; and

processing the rules to generate a multi-level tree representation of the access control list, each of one or more of the levels of the tree representation being associated with a corresponding one of the fields; wherein at least one level of the tree representation comprises a plurality of nodes **(See Cheritan where col. 2 lines 15-18 and 35-37, and col. 4 lines 5-9 where M-trie Plus data structure is a multi-level tree.)**.

Cheriton also discloses wherein for each level of the tree representation that corresponds to a field of a rule of the access control list **(See *Cheriton* col. 4 lines 35-41 where first and second levels corresponding to fields including source and destination address.)**, a master list of nodes is maintained, each node comprising at least one of information characterizing one or more field values associated with that node **(See *Cheriton* col. 3 lines 53-67 where extended ACL List is master list.)**, one

or more subtree pointers for that node, and a reference count indicating how many ancestor nodes are pointing to that node **(See *Cheriton* col. 3 lines 46-51 where oppointer includes pointers for a node and opcode; i.e. subtree pointers and a reference count.)**. *Cheriton* also discloses wherein the tree representation is generated by sequentially processing the rules of the access control list, the processing for a given rule comprising applying values of fields of the given rule to one or more existing nodes of the tree representation **(See col.1 lines 55-59 and col. 2 lines 15-19 of *Cheriton* for access control list processing.)**, and wherein when a particular value of a field of the given rule is applied to a given node **(See col. 2 lines 35-43 where sequence of nodes have applied source and destination address values, see col. 4 lines 5-9.)**.

AAPA in view of *Cheritan* does not explicitly disclose that with two or more of the nodes of a level having a common subtree, the tree representation including only a single copy of that subtree; the subtree comprising at least one node that is not a leaf node of the tree representation; the tree representation being characterizable as a directed graph in which each of the two nodes having the common subtree points to the single copy of the common subtree and a copy is made of the node, the field value is applied to the copied node, and the resultant updated node is added to the master list of the corresponding level.

However, Buia discloses two or more of the nodes of a level of a tree in a directed graph representation having a common subtree pointing to a single copy of the common subtree comprising at least one node that is not a leaf node of the tree **(See Fig. 7B where two nodes 'FAULT A' and 'FAULT F' have common subtree at node**

'FAULT C' where node 'FAULT C' of the common subtree is not a leaf node and the subtree is the only copy in the tree representation. The tree representation is characterized as a directed graph.). *Buia* discloses a copy is made of the node, the field value is applied to the copied node, and the resultant updated node is added to the master list of the corresponding level **(See pg. 8 paragraph [0099] Buia teaches creating copy of node.)**.

At the time of the invention, it would have been obvious to a person of ordinary skill in the art of generating Access Control Lists (ACLs) in a multi-level tree representation (as *AAPA, Cheritan, and Buia)* to have two or more of the nodes of a level of the tree in a directed graph representation having a common subtree pointing to a single copy of the common subtree and discloses a copy is made of the node, the field value is applied to the copied node, and the resultant updated node is added to the master list of the corresponding level as taught by *Buia*. The motivation would have been to optimize efficiency and productivity by creating an ACL tree representation that handles identical tree portions or subtrees by sharing subtrees **(as seen on pg. 3 paragraph [0025] and pg. 9 paragraph [0101] of Buia.)**

Conclusion

6. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within

TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Farhan M. Syed whose telephone number is 571-272-7191. The examiner can normally be reached on 8:30AM-5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Christian Chace can be reached on 571-272-4190. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/F. M. S./
Examiner, Art Unit 2165

/Christian P. Chace/

Supervisory Patent Examiner, Art Unit 2165